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Citation for published version:

McCune, V & Entwistle, N 2011, 'Cultivating the disposition to understand in 21st century university education', *Learning and Individual Differences*, vol. 21, no. 3, pp. 303-310.
<https://doi.org/10.1016/j.lindif.2010.11.017>

Digital Object Identifier (DOI):

[10.1016/j.lindif.2010.11.017](https://doi.org/10.1016/j.lindif.2010.11.017)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Learning and Individual Differences

Publisher Rights Statement:

© McCune, V., & Entwistle, N. (2011). Cultivating the disposition to understand in 21st century university education. *Learning and Individual Differences*, 21(3), 303-310. 10.1016/j.lindif.2010.11.017

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Cultivating the disposition to understand in 21st century university education

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Abstract

This article discusses the need, in 21st century university education, to encourage a ‘will to learn’ in students, and explores its meaning using a variety of empirical evidence. It draws on previous studies related to understanding to introduce the idea of a *disposition to understand for oneself* and to consider how teaching-learning environments can be adapted to encourage this consistent tendency to understand deeply and to be alert to ways of developing it further and using it appropriately. In discussing such environments, particular emphasis is put on the role of Web 2.0 technologies and how they can be used, to support the disposition to understand.

Understanding for the 21st century

In a recent analysis of the demands being placed on universities by rapid changes in society and employment, Barnett (2007) has argued that people have to learn to cope with what he calls *supercomplexity*.

This is an age that is replete with multiplying and contradictory interpretations of the world; it is a world that is discursively open. If complexity is a term that we may apply to the open-endedness of systems, supercomplexity is a term that we may apply to the open-endedness of ideas, perspectives, values, beliefs and interpretations. This is the world with which students struggle to come into a new relationship, as the student’s being ... has to reside within a felt sense of complexity, and, in turn, that being ... has [itself] to become complex. (Barnett, 2007: 36-37)

Barnett is thus suggesting that university education in the 21st century has to enable students to cope not just with the levels and kinds of complexity familiar to students over the years, nor just with the additional complexity that comes from facing more and more unanswerable questions, but also to cope with the personal demands created by existing in such a climate of uncertainty. So, the types of understanding we have to address in university education involve the familiar conceptual understandings and disciplinary ways of thinking and practising (McCune & Hounsell, 2005), but also the development of types of understanding that go beyond these to enable students to engage intellectually and emotionally with supercomplexity. And dealing with such complexity, according to Barnett, depend on students having ‘a will to learn’ (Barnett, 2007).

In considering the ways in which students may need to develop in order to cope with supercomplexity, we look, first, at earlier research into approaches to learning and studying, before looking at contrasting forms of knowledge and understanding. That leads to the idea of a *disposition to understand for oneself* and its relevance for the ‘will to learn’ that Barnett believes to be so important for the future of university education. The later parts of the paper concern how teaching can adjust to the demands of the 21st century, beginning with a brief overview of what general aspects of existing university teaching-learning environments are most likely to cultivate the disposition to understand, before examining more specific approaches to teaching and learning, including Web 2.0 technologies, that seem likely to strengthen this effect. The article concludes by recognising the lack on current research into these possibilities and suggesting what research might be carried out.

Approaches to learning and studying

Our starting point is the long-standing work on *approaches to learning and studying*. The original investigations of Marton and his colleagues in Gothenburg (Marton & Säljö, 1976; 1997) established the crucial difference between *deep* and *surface* approaches, which depended on marked contrasts in students’ intentions – either to understand the meaning or to spot the information that had to be learned. These differing intentions lead, inevitably, to different learning processes, with the deep approach being characterised, in general terms, by relating ideas and using evidence. These two processes are closely similar to the comprehension and operation learning strategies described by Pask (1976) and, when consistently used in combination, amount to a *versatile learning style*. Svensson (1977; 1997) saw the intentions and processes rather differently, with the major difference depending on whether the students were making sense of the article as a whole, integrating the parts into it by using appropriate organizing principles, or memorising unrelated bits of knowledge from it.

Subsequent research in Britain and Australia used inventories to operationalise the distinctive approaches, and this work, in combination with interview studies, indicated that students showed evidence of a certain stability in their approaches, at least where experiences of teaching were similar (Entwistle & Ramsden, 1983; Biggs, 1987). The Gothenburg researchers had argued strongly that approaches were necessarily relational: they depended on the *content* of the task set and the students’ perceptions of the *context* within which the task was being carried out. The subsequent research did not challenge that conclusion, but showed that there were elements of both variability and stability in the approaches. And the stability came, in part, from students’ establishing routine ways of studying that they found effective but, as we shall see later, from a continuing disposition to look for meaning.

The intentional aspect was found to be associated with distinctive forms of motivation (Biggs, 1987; Entwistle, 1988), with the deep approach depending on intrinsic motivation and interest in the content, and the surface approach being related to instrumental forms of motivation and fear of failure. Even where the intention was to understand, that had to be supported both by the necessary learning processes and by application, in the form of effort, concentration, time management, and organized studying (Entwistle & McCune, 2004).

Although the description of the learning processes involved in a deep approach have tended to be described in general terms, it is important to recognize that the range and type of learning processes required to achieve a thorough understanding will vary markedly across disciplines and subject areas (Entwistle, 2009). Nevertheless, the intention to understand is a consistent defining feature of the deep approach across all areas.

Contrasting forms of knowledge and understanding

Later interview studies in Edinburgh explored students' experiences of seeking understanding for themselves, as they prepared for final examinations (Entwistle & Entwistle, 1997, 2003). It was concluded that students described their understanding in ways that varied in terms of its breadth (how much material was integrated), depth (the amount of effort put into establishing patterns of relationship), and structure (the extent to which the understanding had been independently constructed). But, above all, understanding for oneself involved a sense of coherence, connectedness and permanence, that brought with it feelings of pleasure and self-confidence.

[Understanding is] the interconnection of lots of disparate things - I think that's probably the best way to describe it - the way it all hangs together, the feeling that you understand how the whole thing is connected up - you can make sense of it internally... It's as though one's mind has finally 'locked in' to a pattern... When I understand, it is when each step is something I can intuitively think is right, and it's based on a lot of things I have already [learned], ... building up from what you already have... You're making lots of connections which then make sense and it's logical... - like natural selection; once you accept that concept, it's like a million things fit together and you can say "I understand". Almost everything I look at I can understand within this framework... I think when you can do that, you can say you understand something... If you really understand something, why it works, and what the idea is behind it, you can't not understand it afterwards - you cannot '*de-understand*' it! (Entwistle, 2009: 49)

More recent work by Perkins (2008) draws attention to three, qualitatively different, kinds of knowledge or understanding that can be related to academic study. The first is *possessive knowledge* in which students have a conception of learning as the accumulation of bits of knowledge, leading to a surface approach to learning with the intention of simply reproducing the material learned so as to complete requirements, with little interest or engagement with the subject matter. The second is *performative knowledge* in which students recognize the need to understand

the material they are learning, but are more focused on the need to obtain good grades than on engaging with the subject matter deeply, using a strategic approach to studying. The last category is *proactive knowledge* in which students expect learning to enable them to see things in an importantly different way, depending on the active engagement with the subject matter and a deep approach, so as to achieve an understanding that they find personally satisfying. But, from Perkins' perspective, this form of understanding goes further, as the understanding is seen to develop continuously and to be directed forwards to deal with future situations.

How do we know what kind of knowledge we have ...? For the possessive conception, the primary symptom is delivery of demand... With the performance conception, the primary symptom is flexible performances that demonstrate understanding... In contrast to these, the primary symptom of proactive knowledge is opportunistic deployment...

The different kinds of knowledge pose characteristic challenges. What is troublesome about possessive knowledge [is] its volume, so much to know and apply with a kind of honed routine skill... In contrast, the characteristic challenge is one of understanding. The ideas [initially] seem bewildering, evasive, counter-intuitive. And in further contrast with that, the characteristic challenge of proactive knowledge is lively, connection making across diverse contexts. (Perkins, 2008:8-9)

So, proactive knowledge and understanding seems to fit the requirements for coping in an age of supercomplexity. Perkins (2008) describes it as depending on a combination of having a personal reasoned perspective (Perry, 1970), being able to see things in a different way (Saljo, 1979), using a deep approach, having a spirit of inquiry and creativity, and opportunistic deployment – being on the look out for opportunities to make use of earlier understandings and to further develop those existing understandings.

A good example of the distinction between performative knowledge and proactive knowledge can be seen in a recent study of medical students in which contrasting forms of understanding were clearly identified, with equivalent differences in approach (Fyrenius, Wirell & Silén, 2007). While all the students in this study were using a deep approach, some were satisfied with an understanding that would suffice in the examinations and were reluctant to unsettle it by considering additional aspects to – a *holding approach*. In contrast, other students expressed a readiness to expand and restructure their initial understanding to meet the new challenges they were meeting in their clinical work – a *moving approach*. This distinction was summarised in the following way.

Holding Strategies are characterized by a structured reorganisation of information with the intention to reach a final goal... Understanding is constructed by reorganising information... [with] a higher degree of structure and control... When understanding is reached, it can be threatened by new input and [so it] is sealed, held on to. The ability to explain properly is used to verify that understanding has been sealed.

Moving Strategies are characterized by a striving for change in perspectives of the phenomena by using multiple learning modalities and inquiry techniques, [such as] imagination, visualisation, reflection, unconscious processing, inquiry, creativity, [and an] active admission of not understanding. The process is regarded as open-ended. Application of knowledge is used to verify understanding. (Fyrenius, Wirell & Silén, 2007:155-156)

The holding approach, although focused on understanding is still ‘performative’ in Perkins’ sense and, indeed, even has aspects of a surface approach, such as syllabus-boundness and anxiety about being academically inadequate. While the moving approach is still focused partly on examination demands, it is also looking forwards, with a clear recognition that the goal is a professionally useful form of understanding, however incomplete it may seem at first. This approach thus has two elements that suggest that it is ‘proactive’, looking forwards and having a goal that sees academic knowledge as both worthwhile in its own right, and a valuable commodity for future use. As one of the students commented:

If you don’t know how to apply [what you’ve learned] in practice, you only have it in theory, then you haven’t understood... If you can ... think what happens practically, even if you don’t have all the theory, so that you can apply it in your mind, then you’ve understood. And then you can draw parallels and be able to see relations and so on. Then you’ve understood (Fyrenius, Wirell & Silén, 2007: 156)

The disposition to understand for oneself

Another aspect of understanding that runs through all students’ descriptions of having reached their own, personally satisfying, and flexible forms of understanding is that the learning processes are associated, not just with a characteristic form of motivation, but also a distinctive feeling tone. And that can be seen also in the research on *thinking dispositions* that led up to Perkins’ description of proactive knowledge (Perkins & Tishman, 2001; Perkins & Richhart, 2004). While a deep approach brings together motivation and learning strategies, thinking dispositions combine three elements, two of which are similar to those in the deep approach. Perkins and his collaborators describe such dispositions as bringing together ability and understanding, and the willingness to use them effectively, along with a crucial third element - alertness to occasions, including a strong desire to make good use of understandings already developed and to extend those understandings whenever the situation allows.

Effective deployment of a particular pattern of thinking or disciplinary practice requires (1) *alertness* to occasions, (2) a positive *attitude* towards its potential relevance, and of course (3) possession of it and the *ability* to apply it. For instance, an open-minded person has to notice situations when other views are, or even might be, in play (alertness), take them seriously (attitude), and think them through (ability). All that said, ... conceptions of cognitive performance tend to be strongly abilities-centric. The importance of both alertness and attitude gets forgotten...

Proactive knowledge is a transfer-rich view of knowledge. However, proactive knowledge is transfer with a twist... [It] means that the desired transfer has strong emotional and motivational dimensions. In contrast, the emphasis in studies on transfer tends to be doggedly cognitive, hardly looking at all at subjects' engagement with the content. (Perkins, 2008: 9,12)

These ideas prompted us to look again at some of the interviews on students' experiences of seeking understanding in the run up to Finals. Some of the students reaching a deep and tightly integrated personal understanding showed a similar goal to the 'moving' students, one not reported in earlier work that also had a strong feeling tone (Entwistle & McCune, 2009). Not only did these students feel strongly that they had to understand for themselves, but they also cared so strongly about what they had come to understand in their own way that they wanted to demonstrate the depth of their understanding in their examination answers, even within the severe time constraints of a three-hour essay examinations.

I had to go through all the stages of working through (the topic) and showing that I had understood it. I couldn't gloss over the surface. And once I started writing, it all just 'welled up'. I felt that I couldn't interrupt the argument half-way as it was developing... It ties together as a whole - it's very difficult to pick something like that apart, when you understand the theory like that. ... I have to explain it in that way - you can't cut it up and avoid bits. Half an understanding doesn't make sense! ... It's essential to demonstrate your understanding of the whole, and its implications and limitations and you also need to demonstrate a critical approach to any evidence... I have to do it that way, because that's me... Among many of my friends it's more underlying than that; it's not even the will to succeed, it's almost an obsession. (Entwistle & McCune, 2009:43-44)

The underlined words accurately reflect the strength of feeling put into these responses, showing a need both to understand and to demonstrate that understanding to others. This strong feeling of commitment to understanding suggests that it has become a part of that student's sense of identity as a learner. Although the students in this study did not show all the characteristics of the proactive 'moving approach', some showed an inclination towards that approach, but felt constrained by the assessment procedures into a 'performative' mode of learning.

The problem at university is that there is just this immense pressure to learn everything, because you're going to have to do exams at the end of the year... I'm quite resentful in a way, ... because I feel I understand so much more than I can put down in exams... You've got to learn this for exams, so you're always trying to structure it in a way that you know you're going to have to write in this essay question... It's an immense release, now that I've finished university, to know that I can read books without having to learn them, because there's definitely a different way of reading them ... for messages and understanding, whereas for ... the course, it's [just] learning it. (Entwistle & Entwistle, 1997:154)

Barnett (2007) argues that a 'will to learn' is one of the most important continuing dispositions for students to acquire during their time at university. He sees dispositions as necessarily implying continuity over time, but suggests that a will to learn becomes effective only

if accompanied by what he calls a ‘will to offer’, a readiness to put personal understanding into a public arena for critical consideration by others. Without this courage to put forward ideas in this way, the private will to learn leads nowhere; the combination of willingness and putting it into the public arena is seen as necessary in coping with a future world of supercomplexity.

Relating Barnett’s ideas on disposition back to our own research, it seems reasonable to see the ‘will to learn’, as described in the accounts of some of the students, as amounting to a *disposition to understand for oneself* (Entwistle & McCune, 2009). This can be seen as a particular kind of thinking disposition that reveals itself within university and other educational contexts, and appears to be a more consistent and stronger form of the ‘intention to understand’ found in the deep approach to learning, in the sense of wanting to reach the fullest and most satisfying understanding possible at a particular time.

This disposition also contains three elements, similar to those found in thinking dispositions. First, there are *learning strategies* (as a proxy for ability), seen in the versatile use, in interplay, of relating ideas (holist) and the critical use of evidence and attention to detail (serialist). Well developed use of these strategies requires a good grasp of the essence of knowledge and academic discourse within the disciplines or professional areas being studied, or the ways of thinking and practising in the subject (McCune & Hounsell, 2005). The second component of the disposition is the *willingness* to put in the necessary time, effort and concentration to apply the learning strategies effectively, while the final element relates to several forms of *alertness to the context* within which the learning is taking place, or might take place in the future. There is an alertness that monitors the learning processes and strategies in relation to the demands of the task, and an alertness to opportunities provided by the teaching, and within the whole learning environment, to further one’s understanding. The disposition to understand for oneself also leads to a continuing determination to use acquired knowledge and ‘ways of thinking and practising’ in new contexts, as well being more alert to possibilities for applying them.

The next step is to consider in what ways university teaching and learning can affect the development of a disposition to understand for oneself. First, we will consider, in general terms, the research into the effects on learning of the overall teaching-learning environment provided within a degree course, and then, more specifically, examine some specific approaches that offer promising possibilities for helping students to prepare themselves for encouraging the disposition to understand in coping with supercomplexity.

Teaching-learning environments supporting understanding

In considering the general research on university teaching and learning, we shall be looking for approaches that encourage the main defining features of the disposition to understand. We shall

thus have to keep in mind the *ability* to develop and hold a reasoned position on supercomplex issues, including the learning strategies that underpin a deep approach within a specific area of study; the *willingness* to take a reasoned stance in the face of supercomplexity, and the readiness to defend this stance publicly. And finally the *sensitivity to context* that makes students alert to opportunities to develop and apply their understanding, at university and thereafter.

Encouraging a deep approach within teaching-learning environments

Good evidence that the disposition to understand for oneself can be effectively developed would require studies that follow students throughout, and beyond, a programme of study, but such research has yet to be carried out. We can only draw, therefore, on existing studies of how to encourage deep approaches to learning, as a proxy for strengthening a disposition to understand. Existing longitudinal research into teaching-learning environments (TLEs) presents a mixed picture, with the deep approach increasing in some studies and decreasing in others (McCune, 2000; Nieminen, Lindblom-Ylänne & Lonka, 2004). This variability can be attributed to differences in the teaching and learning being encouraged in the environments being investigated, so we need to identify the most important features that are likely to encourage a deep approach. To do this, we can draw on a rich body of research that has explored the impact of teaching-learning environments on approaches to learning (Biggs, 2007; Entwistle & Ramsden, 1983; Hounsell & Hounsell, 2007; Prosser & Trigwell, 1999).

Figure 1 draws attention to influences on learning that have been identified in these and many other studies, and is based on an extensive review of this literature carried out as part of the ‘Enhancing teaching-learning environments in undergraduate courses’ (ETL) project (Entwistle, McCune & Hounsell, 2003; TLRP, 2007). The top half of the diagram briefly indicates some of the student characteristics found to influence learning outcomes, while the lower half describes features of the teaching-learning environment found to affect how students go about their studying. The left hand part shows aspects more directly related to the content and how it is taught, while the other side indicates some of the most important components of the learning environment provided to support learning.

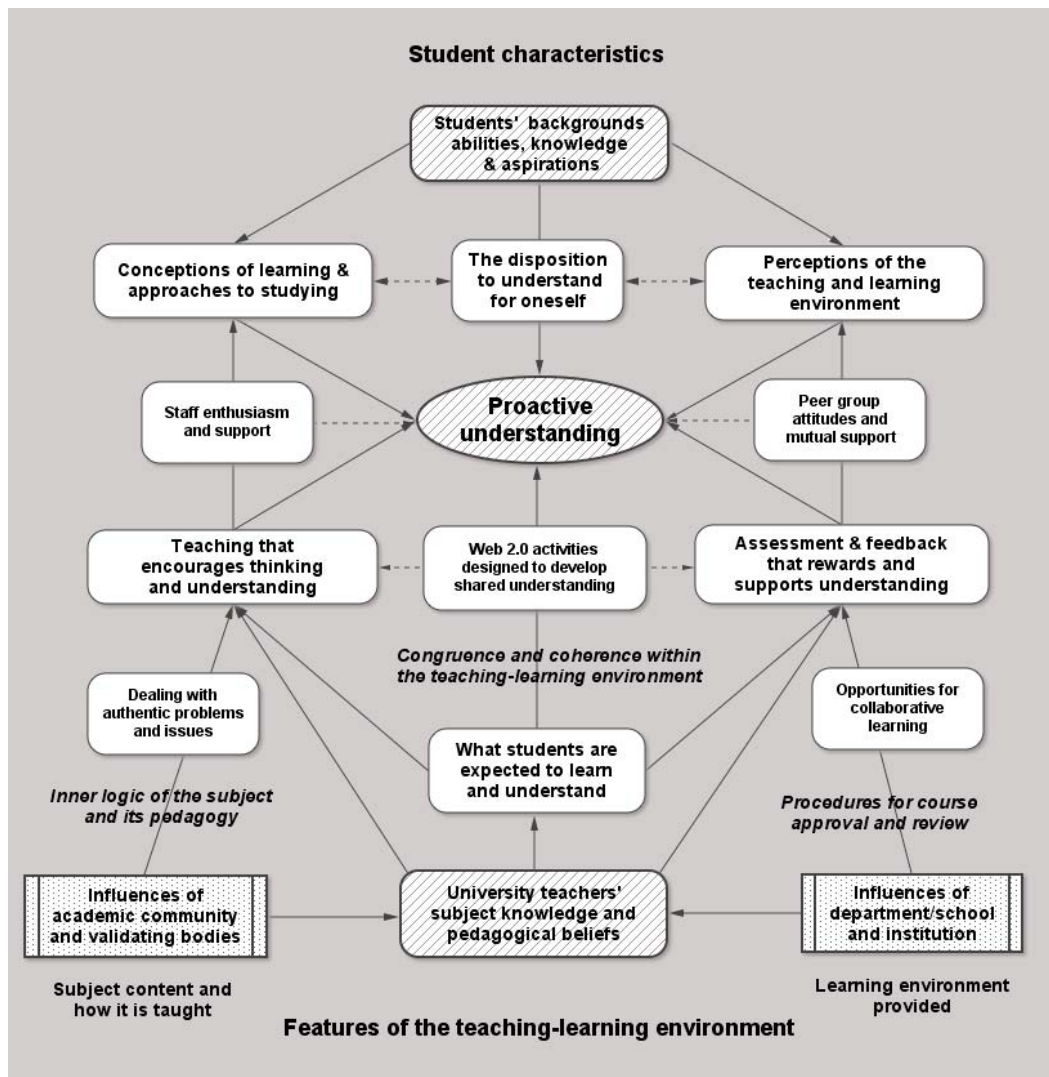


Figure 1 Influences on the quality of student learning

A group of features towards the bottom of Figure 1 describe broad influences such as the university teachers' own subject knowledge and their pedagogical beliefs, along with the external influences of the academic community and the effects of department and institutional policies. Most of the specific influences shown in the boxes are self-explanatory or draw attention to aspects to be discussed below, but two concepts that were developed from analyses of questionnaire and interview data within the ETL project need to be explained: these are *congruence and coherence* within the TLE, and the *inner logic of the subject and its pedagogy*. Descriptions of the other concepts can be found elsewhere (Entwistle, 2009, Chapter 7), where a more elaborate framework is presented.

Research into changing approaches to learning suggests that it is much easier to lead students into surface approaches, particularly through poorly designed assessments (Thomas & Bain, 1984; Scouller, 1998), than to lead to them into deeper approaches. And Eizenberg (1988) pointed out that even one component that encourages a surface approach can have a substantial negative

effect. It is thus important, in designing a supportive TLE that all elements within it are coherent in supporting a deep approach. Biggs (1996) introduced the term *constructive alignment* in arguing for the importance of ensuring that teaching-learning activities and assessment and feedback were directly focused on supporting constructivist aims in designing university courses. In the ETL project, we broadened this notion, using the term *congruence* to suggest that all elements within the TLE needed to be congruent not only with each other, but also with aims focused on understanding but also on the course organisation and management and with students; backgrounds and aspirations (Hounsell *et al.*, 2005).

Biggs' work on 'constructive alignment' ... stressed the importance of establishing course aims focused on understanding and seeking to ensure that teaching and assessment strategies were aligned with those aims... (But) 'alignment' implies a single 'line of sight' between [an aim] and a particular teaching-learning strategy and method of assessment, whereas Biggs himself, and the student learning literature more generally, has stressed the importance of seeing the teaching-learning environment as an integrated whole – a web of interconnections in which any one element out of place can affect how students approach and carry out their learning... The term congruence was judged to convey this broader conception more clearly. (Hounsell *et al.*, 2005: 5-6)

The ETL project also introduced the term *ways of thinking and practising* in the subject to indicate the broad overall aims that university teachers described for their students, either for the degree course as a whole or within a course unit. And within the electronic engineering subject area, where several courses teaching the same main topic were included, it seemed that there were a set of teaching-learning activities that students in all those courses believed to be essential for them to understand for themselves. These activities were also linked closely with the ways of thinking that the staff felt to be most important, leading to the suggestion that there was an *inner logic of the subject and its pedagogy*, implying a necessary and specific link between ways of thinking and teaching-learning activities characteristic of the discipline. Drawing on other studies, it also seems that this term has a more general currency beyond electronic engineering (Entwistle, 2009).

The review of previous studies along with the findings from the ETL project itself provide an overview of the types of teaching, which contribute to the creation of environments that promote understanding and these will be mentioned briefly below. Fuller discussions have already been provided elsewhere (Hounsell *et al.*, 2005; McCune & Hounsell, 2005; Hounsell & Hounsell, 2007; Entwistle, 2009). In the ETL project we came across rather few examples of the use of e-learning embedded within the courses, but more recent developments in teaching and learning suggest the importance of giving these prominence within our review.

Teaching and assessment practices which emphasise understanding

There is evidence in the student learning research literature that teaching and assessment practices which emphasis and support students' understanding can encourage students to take deep approaches and can assist them in coming to grasp the particular ways of thinking which would be required to take a fully deep approach to a particular subject area. Consistent use of such forms of teaching and assessment might therefore contribute in the longer term to the development of a *disposition to understand*.

Teaching which focuses on identifying and engaging with students' current understanding of key concepts and common misunderstandings is one example (Kember, 1997; Meyer & Land, 2005; Prosser & Trigwell, 1999). Hay (in press) has been exploring the use of a broader form of concept mapping, described as *dialogic mapping*, which allows freedom to express the personal meaning of concepts more fully, and encourages deeper reflection on the ideas being considered, looking for connections between those ideas, and discussing the form of the maps and their interconnections with staff and with other students. All of these focus attention on understanding and how different people come to understand in different ways. Assessment which is perceived by students as rewarding understanding, alongside feedback which is timely and informative, are key drivers of fully engaged learning for understanding (Black & Wiliam, 1998; Hounsell *et al.*, 2008; Sadler, 1998).

More recently there has been an emphasis on involving students in active engagement with the ways of thinking of their subject areas, on structuring this engagement effectively, and on making disciplinary practices more accessible or explicit (Hounsell & Anderson, 2009; Northedge & McArthur, 2009). Where students can be supported to develop a strong grasp of the thinking and research processes used by experts in their subject area(s), this should contribute to the *ability* component of the disposition to understand; students can only take a reasoned position on supercomplex issues if they have relevant ways of thinking to bring to these problems. Teaching which gives students access to disciplinary practices may also help students to see the value of learning for understanding and to see themselves as legitimate contributors in a way that enhances their *willingness* to engage (McCune, 2009).

The possible contributions of Web 2.0 technologies

As one purpose of this special issue is to explore possible future directions in research, we will consider how the new possibilities provided by 'Web 2.0' technologies might support the disposition to understand, and indicate the kinds of research needed to investigate whether such technologies can contribute to substantive improvements in students' learning, but at present there is little clear empirical evidence for the impact of such initiatives on the nature of students' learning in higher education (Rollet *et al.*, 2007; Hemmi, Bayne & Land, 2009). Some of the

techniques already being used do seem to be particularly well suited to the development of a disposition to understand, and so it will be worth considering what future research would be needed to fully investigate these possibilities.

While there is no single undisputed definition of web 2.0, this term is typically used to refer to forms of online interaction which incorporate the following characteristics (Alexander, 2006; Anderson, 2007; CICLE, 2009; TLRP-TEL, 2008):

- the use of *microcontent* (small blocks of content such as a single blog post) rather than fixed web pages.
- an *architecture of participation* such that the service is designed to facilitate mass participation, and this participation improves the functioning of the service (for example, where the way in which users label content makes the content more accessible to others).
- high levels of *openness*, which allows multiple users to easily edit, comment on, share and recombine content.
- an emphasis on interaction between multiple users, rather than being broadcast from one author to many readers.

Well-known examples of Web 2.0 activity include blogging, social networking, social bookmarking, and the development of wikis. The possible contributions these may offer will be considered as we look at more specific approaches to teaching and learning that may encourage the disposition to understand.

Some of the proponents of the use of Web 2.0 argue that these technologies can be used to enhance students' grasp of the thinking and research processes used by experts in their subject area(s). These arguments typically relate either to making the thinking process of experts more visible or to providing students with greater opportunities to work collaboratively with experts in their area. One of the main impacts of the move to web 2.0 has been to bring into the public domain previously private reflective and exploratory processes (TLRP-TEL 2008). Technologies such as blogs and wikis invite the sharing of participants' developing ideas and reflections, whereas these would have typically been kept private or shared with a small group in the past. Wikis in particular incorporate the notion of the 'perpetual beta' (TLRP-TEL, 2008) which invites sharing the processes of knowledge creation processes over time in a never-ending sequence.

One of the earliest proponents of the value of networked learning for these purposes was George Landow, whose earlier work predates the notion of Web 2.0. Landow has created a number of hypertext environments for the teaching of English literature, which incorporate different literary texts, critical commentaries, other students' work, as well as maps and other relevant artefacts (Landow, 1997). Undergraduate and postgraduate students then contribute to these environments as part of their assessed work, adding to the corpus of work in the site and making connections between their own work and other material on the site. This activity has also allowed postgraduate students to interact with undergraduates' work in a way that is uncommon in higher education. Much of this work is made public online, some winning awards and attracting interest from publishers, who send books for review on the site (www.landow.com). Commenting on the student experience, Landow notes:

Networked hypermedia systems, in contrast, record and reproduce the relations among texts, one effect of which is that they permit the novice to experience the reading and thinking patterns of the expert.
(Landow, 1997 p. 241)

Web 2.0 technologies have the potential to make these kinds of interactive and public working more realistic in higher education. One example of this being taken forward in practice in higher education is the 'Introduction to Cultural Anthropology' course at the University of Kansas, which was designed by Michael Wesch, who notes about that course:

I like to think that we are not teaching subjects but subjectivities: ways of approaching, understanding, and interacting with the world. Subjectivities cannot be taught. [...] They can only be learned, explored and adopted through practice. [...] My own experiments in this regard led to the creation of the World Simulation. [...] Students are co-creators of every aspect of the simulation, and are asked to harness and leverage the new media environment to find information, theories, and tools we can use to answer our big question [...] They use the wiki to work together to create the "rules" for our simulation [...] exploring some of the most important challenges now facing humanity. (Wesch, 2009, pp. 7-8).

Where it is possible to use Web 2.0 to give students a genuinely enhanced appreciation of how to integrate ideas and participate in a manner more similar to that of experts in the field, it should have considerable potential for developing their capacity to hold a reasoned position on supercomplex issues. This might be particularly the case if Web 2.0 could allow for higher levels of interdisciplinary work. Considerable research, however, is needed to investigate whether web 2.0 can offer a qualitatively different learning experience in this regard.

Alexander (2006) notes that social bookmarking software (the most well know example is del.icio.us) allows users to tag online sources with their own labels, and to share these tags with others. This procedure makes it possible to set up a social bookmarking page for a particular project in which students and staff can share resources. Alexander suggests that such tools can be

used to support collaborative research and to give staff and students new insights into other people's research practices. Other Web 2.0 tools, such as 'Mendeley', have been specifically designed to support shared academic research processes. It seems possible that such tools could offer a genuinely improved learning experience, one which might contribute to the disposition to understand; but, as yet, there has been little research to investigate the extent to which this is happening in practice and having a substantive impact on students' learning.

While the impact of Web 2.0 on the capacity to reason about supercomplex problems is a promising area for future research, it will take considerable work to judge whether the quality of collaboration can be such that it would rival good face-to-face teaching, or support such teaching in a way that would justify the costs involved. A recent report for the TLRP-TEL programme notes that the emancipatory and empowering potential of Web 2.0, in allowing many more people to author and have their voice heard, makes it essential for learners also to develop the necessary discernment to make sense of these sources (TLRP-TEL, 2008). With Web 2.0 content, learners cannot rely on the authority of a particular writer, publisher, or journal referees to judge the quality of what they are reading. A recent report focusing on *Higher Education in a Web 2.0 World* also cautions that students in HE may often lack the information literacies required to properly evaluate Web 2.0 sources (CICLE, 2009). This is not, however, a strong argument against the use of Web 2.0 in HE; rather it suggests the importance of students learning to engage critically with Web 2.0 sources during their time in HE, so that they are prepared to respond well to the increasing use of such tools in the wider world.

Teaching based on authentic open-ended problems

Perkins and his colleagues offer some specific suggestions as to how to cultivate the *sensitivity to context*, which would form part of a *disposition to understand for oneself* (Perkins & Richhart, 2004; Perkins, 2008). They argue that students need to have opportunities to engage with complex real-life problems and to work out for themselves how their understanding of a particular subject can be applied to these problems. Much of Perkins and colleagues work has been done with school children, but the importance of authentic learning experiences in encouraging high quality learning in higher education has also be stressed (see, for example, Tenenbaum et al., 2001; Tynjälä, 1999).

Research with final year biosciences students as part of the ETL project provided some initial evidence that authentic learning experiences may contribute to a *disposition to understand* (McCune, 2009). The students spoke about the impact of particular kinds of authentic learning experiences, which they perceived as well aligned with how scientists would work in professional settings. These experiences involved participating in environments in which the students shared their thinking about ongoing research with professional scientists, dealt with contradictory

findings and contested interpretations, engaged with open-ended research questions, and were trusted to take forward research projects independently. Some of the students spoke of how these experiences led to lasting changes in both their ways of thinking, their identities and their self-confidence, all of which increased their commitment to engage actively with their studies and to see themselves as capable of taking a critical stance on research findings rather than taking them at face value. Some of these points are illustrated in the interchange below, taken from a group interview:

I: You were saying you thought you've become more committed to the subject - I just wondered what makes you?

S1: [...] I think it was the work placement [...] [Before the placement] it was a bit of a farce! [...] I didn't go to as many lectures, and this year I've been to everything. And I can actually see the difference between people who did work placements and people who didn't do a work placement [...] the others are still committed, but I don't think they are really that, I don't know how to put it -

S2: - motivated I think. [...] It has definitely taught me to think more like a scientist and it has also given me a lot more confidence working in the labs on experiments and the interpretation of results

S1: [Placement] is the best thing I could have done. [Without it] I wouldn't have known anything really about the whole background of science. I'd be like, "Oh, here are the facts that we've been given", but I wouldn't have a clue about how people went around doing it [...] You've gone up a level, you're not a student anymore. [...] (McCune, 2009: 355)

Brown and Adler (2008) offer a range of examples of how Web 2.0 technologies may enable authentic learning experiences, which would previously have been impractical. One example is the Faulkes Telescope Project - in which networked learning is used to give students access to high powered telescopes and to support collaborative projects between students and expert astronomers. None of the examples offered by Brown and Adler, however, provide detailed data about the impacts of these experiences on students as learners. This is a significant gap in the research literature, as opportunities for students to see themselves more as 'experts' and less as 'students' can have a powerful effect on the will to learn (McCune, 2009).

Cultivating a sense of legitimate participation

We have already seen how certain kinds of learning experiences can help students to see themselves as legitimate contributors to solving authentic problems and how this can enhance students' *willingness* to develop their understanding and bring it to bear on the challenges they face. More generally, the literature suggests that it is important for learners to develop identities that encompass a sense of themselves as legitimate contributors to knowledge construction (Baxter Magolda, 2009; Bereiter & Scardamalia, 2003; Wenger, 1998). Wenger and others who draw on research into communities of practice focus on how these identities can be developed through

legitimate peripheral participation in relevant communities. Baxter Magolda takes a somewhat broader stance, emphasising respect for students' current understandings and world views while drawing them into a process of shared construction of meaning (Baxter Magolda, 2009; Baxter Magolda & King, 2004).

One of the main arguments made for the value of Web 2.0 for learning is that this:

[This] latest evolution of the Internet [...] has blurred the line between producers and consumers of content and has shifted attention from access to information toward access to other people. New kinds of online resources – such as social networking sites, blogs, wikis, and virtual communities – have allowed people with common interests to meet, share ideas, and collaborate in innovative ways. Indeed, the Web 2.0 is creating a new kind of participatory medium [...] (Brown and Adler, 2008, p.18)

If Web 2.0 technologies could be used to help students to move more quickly towards seeing themselves to be legitimate contributors to meaningful problems, then this might well contribute to the development of aspects of their identities which would support the *disposition to understand*.

One study which does provide empirical data relating to students' experiences of Web 2.0 technologies is reported by Hemmi, Bayne & Land (2009). These authors note that, in the higher education settings investigated in their studies, the ways in which Web 2.0 was used tended to “constrain and contain the possibly more radical effects of these new spaces” (p. 19). This was done, for example, by making typically public tasks like blogging into private activities. Writing about courses that used wikis, these authors note that:

[...] the wiki space space is one which is fundamentally unstable and collectively produced, with a tendency to problematize conventional notions of authorship and ownership. (p. 27)

They go on to report that - while some of the students did describe engaging with the wiki as allowing them to have novel experiences of what it is to be a writer – there was a tendency for the students to be tentative about editing or amending other students' work and to be concerned with appropriate etiquette for this process. Hemmi and her colleagues therefore suggest that there is a challenge for teachers using wikis to help students see the positive benefits of strong engagement in editing each others' work to contribute to a collaborative project. It would presumably be even more challenging to help students recognize that they could engage in genuine contribution to a wiki project involving 'expert' authors.

Future research into cultivating the disposition to understand

The disposition to understand for oneself seems to be an important characteristic for students to develop at university, if they are to cope effectively with the uncertainty and complexity they will meet both in employment and in society at large in the 21st century. Although there has been

extensive research into the types of teaching-learning environments likely to encourage deep approaches, one problem with developing a disposition is that it is a more stable characteristic, less amenable to change through specific experiences. Students would need to experience challenging TLEs that systematically encouraged a focus on personal understanding and rewarded it explicitly through assessment criteria. They would also have to experience authentic problems regularly across the course units they were taking, with staff pointing up their importance and value. In the past, most research into the effects of TLEs has been limited to specific course units and one point in time, whereas it would only be possible to detect changes in the disposition to understand through longitudinal studies in which the whole TLE had been designed for this purpose. That may be unrealistic, but it would be possible to broaden the scope of future studies to recognize the importance of congruence within TLEs within course units in bringing about change in students approaches to learning and, over time, in their dispositions.

Following on from the previous section, it seems that one important task for future research would be to look at contexts within which students engage with Web 2.0 in ways which give them a genuine sense of being legitimate contributors to the process of building solutions to authentic problems. This might then allow them to develop identities that would support the disposition to understand. In order to investigate the full potential of Web 2.0 technologies in this regard, these settings would need to make use of Web 2.0 in ways that provided learning experiences that were qualitatively distinct from what is possible without the use of these tools. These studies would also need to be longitudinal in design in order to investigate possible shifts in learners' identities and their will to learn.

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